RR-02635B-09-0075

ORIGINAL

RAIL CROSSING MODIFICATION PROJECT

"FLAGSTAFF QUIET ZONES"

CITY OF FLAGSTAFF, ARIZONA

60% DESIGN NARRATIVE

DRAFT – FOR REVIEW AND COMMENT ONLY
NOT FOR CONSTRUCTION

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INTRODUCTION

The City of Flagstaff desires to significantly eliminate train horn noise at major railroad crossings within the limits of the City. Pursuant to this objective, in 2004 the City initiated a process to design necessary improvements and process necessary paperwork with the U.S. Department of Transportation, Federal Railroad Administration (FRA) to establish a "Quiet Zone" i.e.: a segment of track traversing the City where train locomotives would be prohibited (except in case of emergency), from sounding otherwise-mandated train horns at railroad crossings. In addition to the FRA, proposed improvements and Quiet Zone establishment are subject to the review and approval of the Arizona Corporation Commission (ACC) and the BNSF Railway.

The project progressed through several phases. A vendor demonstration of "wayside horns" was conducted at each railroad crossing on May 2, 2006 in conjunction with a Diagnostic Team review of the five affected railroad crossings. Strictly speaking, wayside horns do not establish a Quiet Zone as they simply replace the train horn with trackside horns at each crossing. Because the wayside horns are directional, and can be precisely adjusted for sound intensity and focus, they produce much less noise impact than train-mounted horns. The Diagnostic Team included members from the City of Flagstaff, the Arizona Corporation Commission, Railroad Controls Inc (a wayside horn vendor), BNSF Railway and Gannett Fleming the City's consultant at that time.

Results of the Diagnostic Team meeting, together with preliminary design concepts were summarized in the Gannett Fleming report *Quiet Zone/Wayside Horn Update December, 2006,* revised 1-22-2007. Design concepts were further refined in the period from January through August 2007.

In September, 2007, the City of Flagstaff and Gannett Fleming mutually agreed to terminate their association on this project. The City then engaged the Flagstaff firm of Plateau Engineering, Inc. (Plateau) to design necessary improvements and process the proposed Quiet Zones to completion. Plateau had worked as a sub-consultant to Gannett Fleming for survey services, but was not a part of the Diagnostic Team and had not been a part of the development of design concepts prior to being engaged as a prime consultant.

This Design Narrative summarizes the proposed design of the Rail Crossing Modification Improvements necessary for the implementation of a Quiet Zone within the City of Flagstaff.

Rail Crossings Within the Proposed Quiet Zone

Beaver Street	DOT Crossing # 025133N	BNSF Milepost 344.3
San Francisco Street	DOT Crossing # 025132G	BNSF Milepost 344.1
Enterprise Avenue	DOT Crossing # 025131A	BNSF Milepost 342.93

The following crossings propose the use of wayside horns as a one-for-one substitute for train horns within the proposed Quiet Zone.

Steves Boulevard	DOT Crossing # 025099J	BNSF Milepost 341.2
Fanning Drive	DOT Crossing # 025129Y	BNSF Milepost 340.6

Beaver Street and San Francisco Street

Beaver Street (southbound) and San Francisco Street (northbound) constitute a one-way couplet in downtown Flagstaff. Average Daily Traffic (ADT) is somewhat under 8,000 vehicles per day on each street. Current railroad crossing inventory information indicates 93 daily train movements at this location. Maximum timetable speed is 45 miles per hour. In addition to vehicle traffic, the Beaver – San Francisco Street crossings experiences significant two-way pedestrian use. Much of this use is generated by Northern Arizona University (NAU) students going to and from the downtown area, and a significant percentage is after daylight hours.

The Amtrak railroad station is located north of the BNSF main lines between Beaver and San Francisco Streets. The platform for this station extends from west of Beaver Street, through the intervening city block, and terminates east of San Francisco Street.

FRA records indicate that the Beaver Street crossing has had 3 accidents within the past 10 years. Two of these incidents involved motor vehicles, with no injuries. There was one fatal pedestrian incident.

San Francisco Street had 5 accidents in the same time frame. Two of these incidents involved motor vehicles, with both injuries and fatalities. Of the remaining three, two incidents were pedestrian, with injuries, and one was a bicycle fatality.

Qualifying Supplemental Safety Measures proposed for both Beaver and San Francisco Streets are "One Way Streets with Gates".

Current proposed improvements at Beaver Street and San Francisco Streets are shown on sheets C4.0 and C5.0 and include:

- New fencing along the railroad right of way lines to channel pedestrians to the crossing location. The style of proposed fencing will mimic existing fencing at the proposed locations.

- The north side of the railroad right of way between Beaver and San Francisco is the loading platform for the Amtrak station. Fencing will be configured and extended to separate Amtrak boarders from other pedestrians.
- ADA sidewalk treatment. This will consist of installation of truncated domes at hold short locations, and verification of proper slopes and grades.
- Some remedial concrete sidewalk repair and reconstruction will eliminate gaps in the current sidewalk, and allow for the proposed fence construction.
- "No Train Horn" signs.

Notes from the Diagnostic Team meeting (as included in the *Quiet Zone/Wayside Horn Update)*, include the following paragraph:

> *"Within the review of each crossing or option, it was further instructed that pedestrian safety would play a prime role. Supplemental Safety Measures indicated in the quiet zone ruling have no correlation with pedestrian accidents or safety. They address vehicles only. It was brought up that the MUTCD* (ed: Manual for Uniform Traffic Control Devices) *(Part 10 – Traffic Controls for Highway-Light Rail Transit Grade Crossing) section addresses the use of pedestrian barrier installations for light rail transit crossings and that these could possibly be used and modified to address pedestrian safety concerns at Beaver Street and San Francisco Street."*

A MUTCD pedestrian barrier consists of a short fenced "maze" for pedestrians to navigate as they reach the crossing. The intent of this maze is to focus pedestrian attention toward both railroad approaches prior to crossing the tracks. The proposed design does *not* incorporate MUTCD pedestrian barriers, for the following reasons:

Construction of MUTCD pedestrian barriers is severely hampered by the need to maintain Amtrak access to the station platform, BNSF access to BNSF right of way, and local driveway access to the Chamber of Commerce building. In some quadrants there is simply no room for the barrier suggested, or any similar type of improvement. We do not think it appropriate to place MUTCD barriers in only those locations with adequate room to construct, as we feel that any pedestrian safety improvements should be reasonably uniform across all four quadrants of the rail crossing.

A great many of the pedestrians after dark are patrons of local dining (and drinking) establishments. Many are also NAU students, or are of similar age. They often travel in small groups between establishments, and to-and-from NAU. Existing sidewalk widths are narrow, and present an impediment to group passage – many pedestrians walk in the street after hours. The pedestrian barrier "mazes" we feel would be an additional impediment and easily and routinely bypassed.

Gannet Fleming also expressed similar concerns regarding this approach in a letter by Project Engineer Stewart S. Vaghti dated July 19, 2007:

"During the weekend of July 6th and 7th, I spent time in the downtown Flagstaff area between the hours of 6:00 pm and midnight. I observed the following pedestrian behavior at this time:

- *During the daylight hours when vehicular traffic was relatively active, pedestrian traffic primarily utilized the sidewalks with some walking in traffic lanes.*
- *Bicycle traffic primarily utilized bicycle lanes of the traffic lanes.*
- *After it became dark, and when vehicular traffic was reduced, pedestrian and bicycle traffic utilized more of the vehicular travel lanes of the streets and less of the sidewalks.*

It appeared that several of these pedestrian and bicycle lane patterns were from patrons of the local businesses.

As this relates to the pedestrian barriers proposed on Beaver Street and San Francisco Street, ***our concern is that the proposed channelization barriers would not be an effective means of controlling pedestrian traffic and could be a safety concern if a pedestrian needed to get out of the way of an oncoming vehicle."*** (bold added).

The City of Flagstaff concurs with the above assessments, and does not wish to pursue construction of MUTCD pedestrian barriers. The fencing proposed as a part of this project provides a pedestrian barrier which will direct pedestrian traffic to the proper crossing locations. Flashing lights and bell signals will provide audible and visual pedestrian warning.

Enterprise Road

Enterprise Road is the most significant rail-highway crossing within the City of Flagstaff in terms of Average Daily Traffic. Current ADT is roughly 21,000 vehicles per day. The crossing was significantly upgraded in 2002-2003. It currently consists of three northbound lanes and two southbound lanes, separated by an eight-foot median. There are currently four tracks: two mainline and two siding or spur.

Current railroad crossing inventory information indicates 97 daily train movements at this location. Maximum timetable speed is 55 miles per hour. FRA records indicate that the Enterprise Rd. crossing has had 6 accidents within the past 10 years. There was one injury accident, but none involved fatalities. All were vehicle accidents, with all but one involving trucks or truck-trailer combinations. There appear to have been no accidents since the completion of the 2002 – 2003 work.

Current proposed improvements at Enterprise Road are shown on sheets C6.0 and include:

- ADA sidewalk treatment. This will consist of installation of truncated domes at hold short locations, and verification of proper slopes and grades.

- No Train Horn" signs.

No Qualifying Supplemental Safety Measures are proposed for the Enterprise Road Crossing. The Federal Railroad Administration *Quiet Zone Calculator* indicates that the Quiet Zone Qualifies because the Quiet Zone Risk Index (85146.78) is less than the Risk Index with Horns (114085.49).

Alternatively, the Enterprise Road crossing could be evaluated under "Gates with Medians or Channelization Devices". However, the median length north of the crossing - between the crossing gate and Route 66 - less than the minimum 60 feet stipulated per the Supplemental Safety Measure standards. The current median length is slightly over 43 feet. It appears doubtful that the median length could be extended an additional 17 feet without creating a potential conflict for left-turning vehicles onto Enterprise Road from Route 66.

Because intersection does not strictly conform to the requirements of this classification, the intersection would need to receive approval as a "Modified Supplemental Safety Measure" (or "Alternative Safety Measure"). The intersection and rail crossing has functioned very well – with no accidents - since the 2002-2003 reconstruction, and ModSSM/ASM approval hopefully would not be difficult.

Steves Boulevard and Fanning Drive.

Located in easterly Flagstaff, Steves Boulevard and Fanning Drive have very similar characteristics. Both crossings are approximately 300 feet long, and connect Route 66 to Industrial Drive – two roadways which parallel the railroad tracks. The rail track location is approximately centered between the curb lines of the parallel roadways.

Current ADT for Steves Boulevard is slightly in excess of 11,000 vehicles per day. The Fanning crossing has an ADT of roughly 8,100 vehicles per day. Both crossings are four lanes: two northbound and two southbound.

Current railroad crossing inventory information indicates 93 daily train movements at both locations. Maximum timetable speed is 79 miles per hour. FRA records indicate that the Steves crossing has had no accidents within the past 10 years. The Fanning crossing has experienced 3 accidents, with one injury and no fatalities.

The City has elected to use wayside horns at both the Steves and Fanning locations. This removes these intersections from the Quiet Zone category, and wayside horns are considered to be a one-for-one substitute for the silenced train horn.

Wayside horns may be used within a Quiet Zone, and we currently envision creating a Quiet Zone to encompass all the 5 mainline crossings within the City, including the crossings at Steves and Fanning.

Current proposed improvements at Steves Boulevard and Fanning Drive are shown on sheets C5 and C6 and include:

- Installation of wayside horns.
- ADA sidewalk treatment. This will consist of installation of truncated domes at hold short locations, and verification of proper slopes and grades.
- Proper construction of ADA improvements will require relocation of existing driveways at Steves Boulevard which provide access to the BNSF right of way. If BNSF prefers, these driveways can be eliminated instead. (Elimination of driveways at both Steves Boulevard and Fanning Drive was a Diagnostic Team recommendation should four quadrant gates be installed.)
- "No Train Horn" signs.

Quiet Zone Calculator

The FRA *Quiet Zone Calculator* output for the proposed City of Flagstaff Quiet Zone is on the following page.

Diagnostic Team Recommendations

The recommendations of the Diagnostic Team (as compiled by Gannett Fleming) follow the *Quiet Zone Calculator* results.

Print This Page

Cancel Change Scenario: FLAGSTAFF _22985 Continue

Create New Zone
Manage Existing Zones
Log Off

Crossing	Street	Traffic	Warning Device	Pre-SSM	SSM	Risk	
025131A	**ENTERPRISE RD.**	**20836**	**Gates**	0	0	186,196.67	MODIFY
025132G	**SAN FRANCISCO ST**	**7978**	**Gates**	0	14	27,254.75	MODIFY
025133N	**BEAVER ST**	**7642**	**Gates**	0	14	41,988.94	MODIFY

Step by Step Instructions:

Step 1: To specify New Warning Device (For Pre-Rule Quiet Zone Only) and/or SSM, click the MODIFY Button

Step 2: Select proposed warning device or SSM. Then click the UPDATE button.To generate a spreadsheet of the values on this page, click on ASM button—This spreadsheet can then be used for ASM calculations.

Step 3: Repeat Step (2) until the SELECT button is shown at the bottom right side of this page. Note that the SELECT button is shown ONLY when the Quiet Zone Risk Index falls below the NSRT or the Risk Index with Horn.

Step 4: To save the scenario and continue, click the SELECT button

* Only Public At Grade Crossings are listed.

ALERT: Quiet Zone qualifies because QZRI is less than Risk Index with Horns.

Click for Supplementary Safety Measures [SSM]

Click for ASM spreadsheet: ASM
* Note:The use of ASMs requires an application to and approval from the FRA.

Summary	
Proposed Quiet Zone:	Flagstaff QZ
Type:	New 24-hour QZ
Scenario:	FLAGSTAFF _22985
Estimated Total Cost:	$70,000.00
Nationwide Significant Risk Threshold:	19047 .00
Risk Index with Horns:	114085.49
Quiet Zone Risk Index:	**85146.78**

Select

FRA Quiet Zone Calculator

DIAGNOSTIC TEAM RECOMMENDATIONS

1.2 DIAGNOSTIC TEAM

Attendance:

Kurt Anderson, Railroad Controls

Barry Gondron, Gannett Fleming

Chris Watson, Arizona Corporation Commission

Stu Seubert, City of Flagstaff (part time)

Randy Whitaker, City of Flagstaff

Debbie Jo Maust, City of Flagstaff

Gerry Craig, City of Flagstaff (part time)

Megan McIntyre, BNSF

Tom Chilcoat, BNSF

Note: FRA representatives could not attend due to financial situation.

General discussion:

- **Direction**

  The Diagnostic Team was instructed to review the five railroad at-grade crossings under the two options described above. 1 - Wayside horn option; 2 – Quiet Zone option.

- **Pedestrian Safety**

  Within the review of each crossing and option it was further instructed that pedestrian safety would play a prime roll. Supplementary Safety Measures indicated in the quiet zone ruling have no correlation with pedestrian accidents or safety. They address vehicles only. The Diagnostic Team was instructed to consider mitigation factors for pedestrian safety at each crossing. It was brought up that the MUTCD (Part 10 – Traffic Controls for Highway-Light Rail Transit Grade Crossing) section addresses the use of pedestrian barrier installations for light rail transit crossings and that these could possibly be used and modified to address pedestrian safety concerns at Beaver Street and San Francisco Street situations.

- **Wayside horn maintenance recommendations**

  Discussions with Railroad Controls Limited indicated it was in the best interest for the city to supply their own maintenance for the wayside horns. Citing financial consideration and response time as the primary factor for this recommendation. Installations of the wayside horns include operating and maintenance technical training for the City's traffic signal or electrical supervisor.

- **Cost**

  No costs are to be considered during Diagnostic Team recommendations.

1.3 LIABILITY

No one with BNSF, Corporation Commission, or the FRA has indicated there is any quantified liability comparison between the Risk Index of a crossing, pedestrian safety and wayside horns.

1.4 PROCESS

General process for:

- **Signing direct agreement with BNSF for wayside horn use.**

  The BNSF currently has in possession agreements for installation of wayside horns. The city would be required to execute these agreements at minimum administrative costs. An 11-month schedule is anticipated at this time for implementation. Unless other wise noted the duration for the schedule starts when the City chooses the desired safety equipment.

- **Creating Quiet Zone without BNSF ordering and installing four-quadrant gates.**

  Agreements would be required for installation of Safety measures placed on existing BNSF right of way for the activation of the quiet zone. The cost would vary from minimum administration cost to improvement easements with yearly fees depending on the option chosen per crossing. A 19-month schedule is anticipated at this time for implementation.

- **Creating Quiet Zone with BNSF ordering and installing four-quadrant gates.**

  Construction and maintenance agreements would be required for the installation of the additional gates. At present BNSF has not identified what these would include as not many agreements of this type has been implemented. A 29-month schedule is anticipated at this time for implementation.

- **Creating Quite Zone - Notice of Intent.**

  The City must provide a Notice of Intent to create a Quiet Zone. This notification must be sent via certified mail, return receipt request, to all railroads operating over the crossings in the proposed Quiet Zone, to the State Agency responsible for roadway safety and the agency responsible for grade crossing safety (Arizona Corporation Commission). The purpose of this Notice of Intent is to provide an opportunity for the railroads and State agency to provide comments and recommendations to the public authority as it plans the Quiet Zone. The railroad and State agency will have 60 days to provide these comments to the public authority.

2.0 DIAGNOSTIC TEAM'S ANALYSIS AND RECOMMENDATIONS

Each Crossing was looked at under two options:

1. Use of wayside horns.
2. Creation of a Quiet Zone.

In either case the use of signage indicating the changed condition will be needed.

Conceptual cost and schedule for each crossing is provided in the Appendix to this report.

2.1 BEAVER STREET

2.1.1 Wayside Horns (Exhibit W-1)

- Place a horn at the northwest and south/west corner of the crossing. One horn facing north and one facing south.
- Fencing going along BNSF right-of-way to channel people to the crossing in front of the horn.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.1.2 Quiet Zone with Pedestrian Barrier (Exhibit QZPB-1)

- Fencing along BNSF right-of-way to channel people to crossing.
- Pedestrian barriers at Beaver Street on south side of crossing to channel people to one location where signage is located. Signage would indicate that there are no horns and second train may be coming. This in theory would function as a +staging area much as at theme parks (Exhibit PB).
- Relocate or redesign driveways adjacent to crossing on south side.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.1.3 Quiet Zone with 4-Quad Gates (Exhibit QZ-1)

- Fencing along BNSF right-of-way to channel people to crossing.
- Install Four Quadrant Gates with vehicle detection between gates.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.2 SAN FRANCISCO STREET

Options are the same as Beaver Street except north and south treatments are reversed.

2.2.1 Wayside Horns (Exhibit W-2)

- Place a horn at the north/west and south/east corners of the crossing. One horn facing north and one facing south.
- Fencing going along BNSF right-of-way to channel people to the crossing in front of the horn.
- A third horn will be added facing the Amtrak area.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.2.2 Quiet Zone with Pedestrian Barriers (Exhibit QZPB-2)

- Fencing along BNSF right-of-way to channel people to crossing.
- Pedestrian barriers at San Francisco Street on north side of crossing to channel people to one location where signage is located. Signage would indicate that there are no horns and second train may be coming. This in theory would function as a staging area much as at theme parks (Exhibit PB).
- Driveway for Amtrak will not be closed but improvement will be made to emphasis that only left turns are allowed.
- Add larger left turn arrow on Amtrak drive.
- Add left turn sign across from Amtrak drive.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.2.3 Quiet Zone with 4-Quad Gates (Exhibit QZ-2)

- Fencing along BNSF right-of-way to channel people to crossing.
- Install Four Quadrant Gates with vehicle detection between gates.
- Add larger left turn arrow on Amtrak drive.
- Add left turn sign across from Amtrak drive.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.3 ENTERPRISE ROAD

2.3.1 Wayside Horns (Exhibit W-3)

- Horns will be placed at the northwest and southeast corners of crossings. In addition two horns will be placed on an existing light pole in the south median with one horn facing north and another facing south.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.3.2 Quiet Zone with Reflective Paddles (Exhibit QZ-3)

- The existing median will be submitted to the FRA as an alternative safety measure (ASM). The median would qualify as a standard safety measure but the north median is shorter than the standard. Reflective paddles will be used to limit access and mark median.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.4 STEVES BLVD.

2.4.1 Wayside Horns (Exhibit W-4)

- Horns will be placed at the northwest and southeast corners of crossings.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.4.2 Quiet Zone with 4-Quad Gates (Exhibit QZ-4)

- Four Quadrant Gates installed.
- Close Driveways at BNSF ROW.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.5 FANNING DRIVE

2.5.1 Wayside Horns (Exhibit W-5)

- Horns will be placed at the northwest and southeast corners of crossings.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.

2.5.2 Quiet Zone with 4-Quad Gates (Exhibit QZ-5)

- Four Quadrant Gates installed.
- Close Driveways at BNSF ROW.
- ADA sidewalk treatment.
- Place "No Train Horn" signs.